

**REMARKS**

Claims 20-34 and 36-53 are pending. Claims 1-19 and 35 have been previously cancelled. Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement. Claims 20, 23-34, 36-37 and 40-53 are rejected under 35 U.S.C. § 103(a) as being unpatentable over "Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced Computational Burden" ("Martin") in view of Applicant's admitted prior art in Brief Description of Related Art on page 1 of the present application ("AAPA"). Claims 21-22 and 38-39 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Martin in view of AAPA, as applied to claims 20 and 37, and further in view of USP 5,592,517 ("Camp"). The Applicant respectfully traverses these rejections at least for the reasons previously set forth during prosecution and at least based on the following remarks.

**I. RESPONSE TO EXAMINER'S ARGUMENTS**

**A. Claim Rejections under 35 U.S.C. § 112, First Paragraph**

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement. Specifically, the Examiner states the following:

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

"The amendment filed 01/09/2009 and 06/17/2009 are objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention.

The added material which is not supported by the original disclosure is as follows: The newly added limitations in the amended claims "**DSP that applies LESS to adaptive filtering of adaptation observations for communication and control signals, wherein during said adaptive filtering, the DSP enables:**" (claim 20) and "**at least one DSP that applies LESS to transform ...**" (claim 37) are considered new matter introduced into the disclosure. Applicant is required to cancel the new matter in the reply to this Office Action."

See the Final Office Action at pages 11-12 (with emphasis).

"The examiner respectfully submits that the current amendment does not cure the issue with the previous rejection under 35 U.S.C. 112 1st paragraph since the amendment just wording the same subject matter differently. The applicant does not provide any concrete citation within the specification to support the enable/written description of the newly added subject matters. In another word, the examiner cannot find, within the specification, **a clear support of a DSP that applies LESS to adaptive filtering of adaptation observations for communication and control signal as cited in claim 20 and at least one DSP that applies LESS for transformation as cited in claim 37**. At most, the specification mentions briefly "a DSP" as applying LESS on a programmable machine like a DSP but silences a DSP that applies LESS to adaptive filtering of adaptation observations for communication and control signal as cited in claim 20 and at least one DSP that applies LESS for transformation as cited in claim 37. Figures 2-6 and page 3 of specification of the present application are merely the building block of xBOT structure, they neither disclose an at least DSP that applies LESS or a DSP that applies LESS to adaptive filtering of adaptation observations for communication and control signals as responded by the applicant. The examiner respectfully requests the applicant clearly and specifically point out, within the original specification, the support the above limitations."

See the Final Office Action at pages 12-13 (with emphasis).

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

The Examiner alleges that Applicant's claimed DSP element applying LESS to adaptive filtering does not find support in Applicant's specification. The Applicant respectfully disagrees, and submits that the DSP element has been mentioned at least once in connection with the invention claimed in claims 20 and 37, as an applicable example in the specification.

For example, with regard to the rejection of claim 20 under 35 USC 112 First paragraph, Applicant's specification in page states the following:

"The advantages of **this invention** are: 1) Reducing the number of operations required for **applying a Least Square Solver (LESS) on** a programmable machine like a **Digital Signal Processor (DSP)** by up to 50%...."

Applicant's above citation has at least provided an example of using the invention, namely, the **number of operations in a DSP can be reduced by applying LESS**. In addition, the Examiner is referred to page 2 of Applicant's summary of invention, which states:

"An object of **this invention** is to reduce the complexity in **implementing an adaptive filter**."

Applicant's above citation also discloses that the invention (i.e., **applying LESS** to reduce the number of operations **in a DSP**), reduces the complexity in **implementing an adaptive filter**. In other words, Applicant's above citation at least discloses an aspect of the invention recited in claim 20, namely, using "a DSP by applying LESS to perform adaptive filtering operation", where the

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

complexity of the DSP adaptive filtering operation is reduced. The Examiner is also referred to Applicant's specification in page 1, which states:

**"This invention relates to adaptive systems, in the areas of communication and control..."**

Since adaptive filtering is in the areas of communication and control, which is performed **by a DSP that applies LESS**, likewise, Applicant's claim 30 is also enabled.

Therefore, based on the foregoing rationale, the Applicant maintains that "a DSP that applies LESS to adaptive filtering of ..., wherein during said adaptive filtering, said DSP performs...", as recited in Applicant's claim 20, and "**...at least one DSP that applies LESS to transform ...**", as recited in Applicant's claim 37, are supported by Applicant's specification, and no new matter has been introduced. The Applicant respectfully requests that the rejection to claim 20-34 and 36-53 under 35 USC 112, first paragraph, be withdrawn.

**B. Rejection of Independent Claims 20 and 37 under 35 U.S.C. § 103 (a)**

With regard to the rejection of claim 20 under 35 USC 103(a), the Examiner states the following:

"The applicant responses to the examiner's arguments in pages 15-18 for claims that the support for new matter is seen in page 3 of the specification; the AAP A does not disclose using a DSP which is a hardware device to perform the adaptive signal processing and finally Martin only discloses effectively enlarges the real number

matrix to twice its size and not generating two real number matrices as required by the claims.

The examiner respectfully submits that Figures 2-6 and page 3 of specification of the present application are merely the building block of xBOT structure, they neither disclose an at least DSP that applies LESS or a DSP that applies LESS to adaptive filtering of adaptation observations for communication and control signals as responded by the applicant. The examiner respectfully requests the applicant clearly and specifically point out, within the original specification, the support the above limitations. DSP can be either software base or hardware base wherein the AAP A does not exclude the DSP as either software base or hardware base. Thus, AAP A reasonably discloses the DSP for processing the communication signals wherein whichever processes the communication signals is considered as DSP. In addition, the DSP is well-known in the art as either software base or hardware base for processing data or signals. Martin does not disclose the effectively enlarges the real number matrix to twice its size and not generating two real number matrices as alleged by the applicant but rather **Martin discloses a transformation of a complex matrix into two real matrices as cited by the claim wherein the two real matrices are formed as single large matrix similar to G matrix such that  $T(A_{mxm}) = R_{mx2m} = [R^1_{mxm} | R^2_{mxm}]$ .**

See the Final Office Action at pages 13-14 (with emphasis). The Applicant points out that Martin discloses a Unitary ESPRIT algorithm to reduce computational burden in **estimating the phase delays between two subarrays** in a phase array antenna sensor (see Martin's Abstract and left column of page 1232). In other words, Martin discloses a Unitary ESPRIT algorithm **starting with two complex matrices**, where the computation of two complex matrices are reduced by transforming **the two complex matrices into real-valued matrices of the same size** using Lee's centro-Hermitian matrices method (see Martin's right column of page 1232). The Examiner is referred to the following citation of Martin:

Unitary ESPRIT effectively **doubles the number of data samples**, the computational complexity is reduced by **transforming the required rank-revealing factorizations of complex matrices into decompositions of real-valued matrices of the same size...**"

See Martin at page 1232, right column, lines 3-7 (with emphasis). Martin discloses that data samples are doubled effectively, which is due to using data samples from **two sub-arrays** (sensor doublets) in phase delay calculation (see Martin's equations [4] and [10]-[12], [18]). In this regard, the Examiner seems to have misconstrued Martin's **(two)** complex matrices **as a single** complex matrix, consequently, Martin's two real-valued matrices of the same size corresponds to the results of transformation Martin's **(two)** complex matrices into a single double sized real-valued matrix, **and** applying Total Least Square solution (TLS) to partition the single double sized real-valued matrix into two real-valued matrices of the same size (see Martin's equations [4] and [10]-[12], [18]).

In addition, the Applicant also points out that Martin discloses the two subarrays represent a total number of  $M=2m$  sensors (see Martin's page 1234, left column). Therefore, the Examiner's argument that Martin's "**two real matrices are formed as single large matrix** similar to  $G$  matrix such that  $T(A_{mxm}) = R_{mx2m}$ ", refers to the transformed real matrices of the  $2m$  sensors from the two subarrays.

Based on the foregoing disclosure, the Applicant submits that Martin's centro Hermitian transformation method (the alleged "Binary Orthogonal

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

Transformation (BOT)" operates by **transforming two complex matrices** (i.e., phase delay from each of the two subarrays) **into one large double size single matrix of real value**. In this regard, the Applicant maintains that Martin at least does not disclose or suggest "**transforming** said adaptation observations **from a complex arithmetic to two corresponding sets of real number arithmetic observations** by means of binary orthogonalization transformation (BOT)...," as recited in Applicant's claim 20.

Furthermore, the Applicant also points out that Martin discloses using total least square solution (TLS) (the alleged "LESS") to compute the **single double sized real-valued matrix, by partitioning the single double sized real-valued matrix into two real-valued matrices** (see Martin's page 1237 lower right column and page 1238, left column, and equations [24], [31]-[32]). Therefore, the Examiner's argument that Martin's "**two real matrices are formed as single large matrix** similar to G matrix such that  $T(A_{mxm}) = R_{mx2m} = [R^1_{mxm} \mid R^2_{mxm}]$ ", refers to the **partitioning operation of the total less square solution (TLS)** (the alleged "LESS"), **not the transformation operation** as alleged by the Examiner. In this regard, Martin also does not disclose or suggests "**computing two corresponding sets** of real number arithmetic adaptation parameters **by applying two respective real number LESS to said two corresponding sets of real number arithmetic observations**," as recited in Applicant's claim 20.

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

Moreover, even assuming arguendo, that AAPA discloses using LESS in adaptive filtering (the alleged "a DSP applies LESS to adaptive filtering..."), nevertheless, AAPA still does overcome the above deficiencies of Martin. In this regard, the Applicant maintains that the combination of Martin and AAPA does not establish a *prima facie* case of obviousness to reject Applicant's claim 20. Claim 20 is submitted to be allowable.

The Examiner in pages 14-16 of the Final Office Actions made other arguments regarding Applicant's claim 20. The Applicant believes that Applicant's above rebuttal to Examiner's arguments are sufficient to render Examiner's remaining arguments moot.

## **II. Claim Rejections under 35 U.S.C. § 112, First Paragraph**

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement. The Examiner is referred to Applicant's above arguments in section I-A. The Applicant maintains that the amendments to claims 20 and 37 are supported by Applicant's Specification. Claims 21-34, 36, and 38-53 depend directly or indirectly from independent claims 20 and 37 respectively. The Applicant respectfully requests that the rejection to claims 20-34 and 36-53 under 35 U.S.C. § 112, first paragraph be withdrawn.

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

### III. REJECTION UNDER 35 U.S.C. § 103

In order for a *prima facie* case of obviousness to be established, the Manual of Patent Examining Procedure, Rev. 6, Sep. 2007 ("MPEP") states the following:

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."

See the MPEP at § 2142, citing *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), and *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). Further, MPEP § 2143.01 states that "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art" (citing *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007)). Additionally, if a *prima facie* case of obviousness is not established, the Applicant is under no obligation to submit evidence of nonobviousness:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

See MPEP at § 2142.

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

**A. The Proposed Combination of Martin and AAPA Does Not Render Claims 20, 23-34, 36-37 and 40-53 Unpatentable**

The Applicant now turns to the rejection of claims 20, 23-34, 36-37 and 40-53 under 35 U.S.C. 103(a) as being unpatentable over Martin in view of AAPA (Fig. 1 of the present application).

**A(1). Rejection of Independent Claims 20 and 37 under 35 U.S.C. § 103 (a)**

With regard to the rejection of independent claim 20 under 35 U.S.C. § 103(a), the Applicant submits that the combination of Martin and the AAPA does not disclose or suggest at least the limitation of “**transforming** said adaptation observations **from a complex arithmetic to two corresponding sets of real number arithmetic observations ...**,” as recited in claim 20 by the Applicant.

In the Final Office Action, the Examiner alleges Martin discloses the following:

“... transforming adaptation observations from a complex arithmetic to two sets of real number arithmetic observations by means of binary orthogonalization transformation (BOT) (e.g. page 1232 right column lines 3-17 which transforming/converting the complex matrices into a set of real matrices)”

See the Final Office Action at page 3 (with emphasis). Specifically, The Examiner relies for support on Martin, page 1232, which states:

Unitary ESPRIT effectively **doubles the number of data samples**, the computational complexity is reduced by **transforming the**

**required** rank-revealing factorizations of **complex matrices** into decompositions of **real-valued matrices of the same size...**"

See Martin at page 1232, right column, lines 3-7 (with emphasis). The Examiner is referred to Applicant's above arguments in section I-B, namely, the Examiner seems to have misconstrued Martin's (**two**) complex matrices **as a single** complex matrix, consequently, Martin's two real-valued matrices of the same size corresponds to the results of transformation of the Martin's (**two**) complex matrices into a single double sized real-valued matrix, **and** applying Total Least Square solution (TLS) to partition the single double sized real-valued matrix into two real-valued matrices of the same size (see Martin's equations [4] and [10]-[12], [18]).

Consequently, the Applicant maintains that Martin at least does not disclose or suggest "**transforming** said adaptation observations **from a complex arithmetic to two corresponding sets of real number arithmetic observations** by means of binary orthogonalization transformation (BOT)...," as recited in Applicant's claim 20.

Furthermore, the Applicant also points out that Martin discloses using total least square solution (TLS) (the alleged "LESS") to compute the **single double sized real-valued matrix, by partitioning the single double sized real-valued matrix into two real-valued matrices** (see Martin's page 1237 lower right column and page 1238, left column, and equations [24], [31]-[32]). Therefore, Martin also

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

does not disclose or suggests "**computing two corresponding sets** of real number arithmetic adaptation parameters **by applying two respective real number LESS to said two corresponding sets of real number arithmetic observations**," as recited in Applicant's claim 20.

In the Office Action, the Examiner concedes the following:

"Martin et al. fail to explicitly spell-out the term LESS as a means for computing two sets of real number arithmetic adaptation parameters by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations."

See the Office Action at page 4. The Examiner relies for support on the Applicant's discussion of prior art (AAPA) in page 1 of the pending application and states the following:

"However, the admitted prior art discloses in page 1 a means for computing **two sets of real number** arithmetic adaptation parameters **by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations** (e.g. last two paragraphs in page 1 wherein LESS is common and most widely used in solving such systems of linear equations)."

See the Office Action at page 5 (with emphasis). The Applicant maintains the arguments in pages 23-25 of the 6/17/09 response. In addition, even assuming arguendo, that AAPA discloses using LESS in adaptive filtering (the alleged "a DSP applies LESS to adaptive filtering..."), nevertheless, AAPA still does not overcome the above deficiencies of Martin.

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

Accordingly, based on the foregoing rationale, the Applicant maintains that the combination of Martin and AAPA does not establish a *prima facie* case of obviousness to reject claim 20. The Applicant respectfully requests that the rejection to claim 20 under 35 U.S.C. § 103(a) be withdrawn, and independent claim 20 should be allowable.

Likewise, independent claim 37 is similar in many respects to independent claim 20, and is also submitted to be allowable. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 20 and 37.

**A(2). Rejection of Dependent Claims 23-34, 36 and 40-53**

The Examiner in the Final Office Action has not provided a rebuttal to Applicant's above dependent claims. Based on at least the foregoing, the Applicant believes the rejection of independent claims 20 and 37 under 35 U.S.C. § 103(a) as being unpatentable over Martin in view of AAPA has been overcome and requests that the rejection be withdrawn. Additionally, claims 23-34, 36 and 40-53 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable.

In addition, with regard to the rejection of claims 31 and 48, the Examiner is referred to the similar argument in claim 20, that the combination of Martin and the

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

AAPA does not disclose applying two real numbers to LESS (likewise to also CLESS). Therefore claims 31 and 48 are submitted to be allowable.

Additionally, claims 23-34, 36 and 40-53 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable.

**B. The Proposed Combination of Martin, AAPA and Camp Does Not Render Claims 21-22 and 38- 39 Unpatentable**

With regard to the rejection of claims 21-22 and 38-39, the Examiner has cited the AAPA in Fig. 1, where the LESS block 100 is applied in series, alleging that the LESS block 100 also discloses the Applicant's claimed "two real number LESS are applied in series". The Applicant points out that the LESS block 100 discloses a single input of complex-valued vector input in series, not "two real number applied in series". The Examiner relies for support on Camp to disclose the AAPA's deficiencies. However, Camp still does not disclose the deficiencies of Martin and AAPA in independent claims 20 and 37.

Additionally, claims 21-22 and 38- 39 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable. Furthermore, the Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 21-22 and 38- 39.

Application № 09/911,764  
Reply to Final Office Action of October 28, 2009

**CONCLUSION**

Based on at least the foregoing, the Applicant believes that all claims 20-34 and 36-53 are in condition for allowance. If the Examiner disagrees, the Applicant respectfully requests a telephone interview, and request that the Examiner telephone the undersigned Patent Agent at (312) 775-8093.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

A Notice of Allowability is courteously solicited.

Respectfully submitted,

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